



R90

USER MANUAL



Foreword

Introduction

Thank you for choosing the RTK product from Shanghai AllyNav Technology Co., Ltd. To learn more about the intelligent RTK or other products of us, please visit our official website at www.allynav.com.

This manual introduces the RTK product and its associated operating software and provides details on how to set up, connect, configure, and use the product. In case of any discrepancies between the icons and images in this manual and the actual product, please refer to the actual product. To ensure optimal use of our RTK product, we recommend you read this manual carefully before operating the device.

Company Profile

Shanghai AllyNav Technology Co., Ltd. is a high-tech company specializing in research and development, production, sales, and service. Based on GNSS satellite navigation technology, we are committed to expanding the applications of GNSS and providing our clients with comprehensive and diverse high-precision navigation and positioning solutions. AllyNav closely follows the global development trends of the four major satellite navigation systems, deploying high-precision applications across various industries. We strive to meet the diverse needs of various sectors. Our products are applied in precision agriculture, intelligent transportation, geographic information, surveying and mapping, and more.

Our core team members have been recognized with numerous national, provincial, and ministerial-level awards for their contributions to science and technological advances progress, with more than 10 years of experience in satellite navigation research and development, industry applications, product promotion, and technical service. Our primary products and services include high-precision GNSS boards, high-precision GNSS receivers, wireless data transmission devices, integrated navigation products, deformation monitoring systems, autonomous driving systems, intelligent navigation, variable control, solutions, and related software development.

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User Notice

- Before using this product, carefully read all user materials provided to ensure you understand how to use the product and are aware of all safety precautions.
- Do not connect or disconnect any cables, including the base station antenna or serial port cables, while power is on.
- Connect your device strictly in accordance with the manual. Firmly hold the connector and gently insert and remove when connecting or disconnecting cables. Avoid pulling, forcing, or twisting cables, as this may damage pins.
- When powering the product (system), observe the power requirements for the device
- Do not use damaged cables. Replace damaged cables promptly with new ones to avoid harm and ensure optimal performance.
- Damage to the device caused by force majeure (lightning, high voltage, impact) is not covered by the warranty.
- Do not disassemble the product. Doing so will void the warranty.

Product Features

> Efficient operation

- Linux intelligent OS, stable system, powerful functions
- WEBUI supports mobile device to connect the device via WIFI for convenient monitoring of device information and configuration of working mode;
- Supports the insertion of external SIM cards to use the receiver network.
- It is not necessary to verify to check the bubble for tilts up to 120° (operation within a 60° tilt range is recommended for optimal accuracy.)
- The bottom camera supports AR stakeout.
- The laser module supports laser measurement function
- At least 40% improvement in surveying efficiency
- At least 40% improvement in stakeout efficiency
- Significant reduction in operator fatigue

> Consistently High Accuracy

- The receiver, integrated with an inertial measurement unit, ensures real-time and interference-free tilt compensation, unaffected by magnetic fields or surrounding metallic structures.
- 2CM accuracy in tilt compensation ($<60^{\circ}$).

Contents

I. Product Description	1
1.1 Buttons and indicators of R90	1
1.2 Bottom panel description of R90	2
II. RTK Surveying Workflow	3
2.1How to operate the AllyPad	3
2.1.1 Create/Open a project	3
2.1.2 Connect to device	3
2.1.3 Configure base station and rover modes	4
2.1.4 Parameter configuration	6
2.1.5 Surveying work	8
2.1.6 Export data	11
2.2 How to operate WEBUI	12
2.2.1 Login	12
2.2.2 Receiver Status	12
2.2.3 Work Mode	13
2.2.4 GNSS information	15
2.2.5 NetWork Setting	16

2.2.6 Data Communication	16
2.2.7 System setting	17
III. Firmware Update	18
IV. Advanced Functions	18
4.1 Base station shift warning	18

I. Product Description

1.1 Buttons and indicators of R90



Power LED: bi-colour light, the red light is constantly on when charging; the green light is constantly on when fully charged; and the red light is constantly on when working.



BL LED: Green, the light is constantly on when connected otherwise off



Satellite indicator: Green, flashes when receiving satellite signals; otherwise off



Differential LED: Green, flashes once per second when it flashes when transmitting, receiving or storing data; otherwise off.

1.2 Bottom panel description of R90



USB interface: Charge and Debug

SIM card slot: Supports Nano SIM

UHF interface: SMA interface

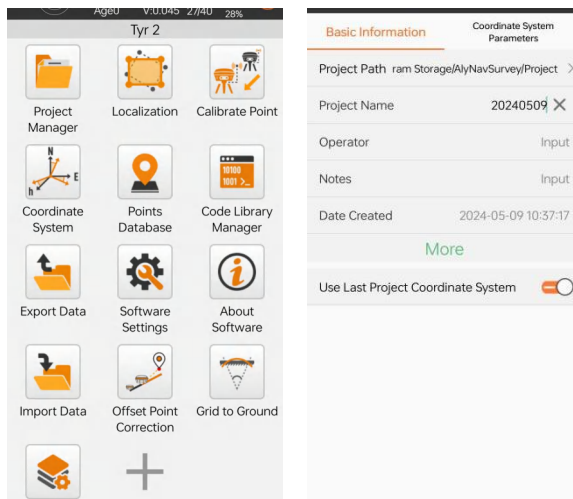
II. RTK Surveying Workflow

2.1 How to operate the AllyPad

2.1.1 Create/Open a project

Click Project - Project Management - New. Enter relevant project information and coordinate system parameters. Select the coordinate system and modify central meridian.

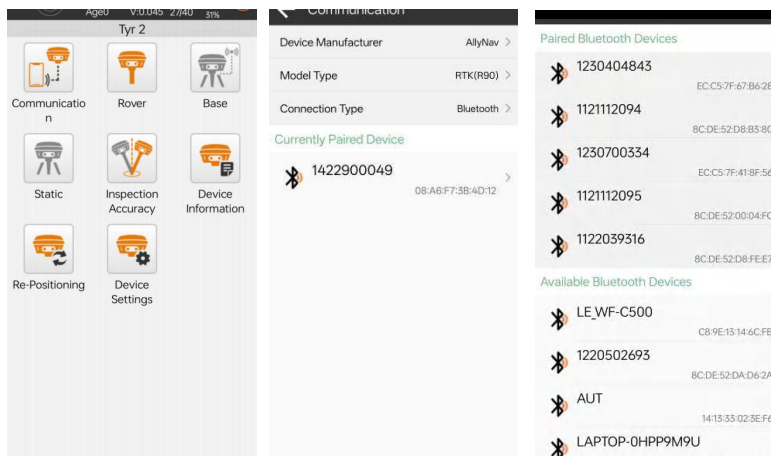
Click OK to create a new project.



2.1.2 Connect to device

Click Device - Communication Settings. For initial connection, press the blank area under Device Parameters. The software will automatically search for Bluetooth devices.

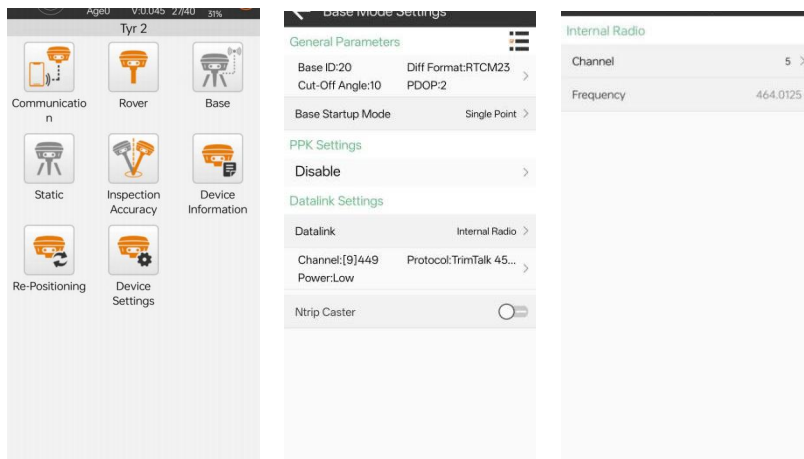
Select the correct RTK device SN and press Connect.



2.1.3 Configure base station and rover modes

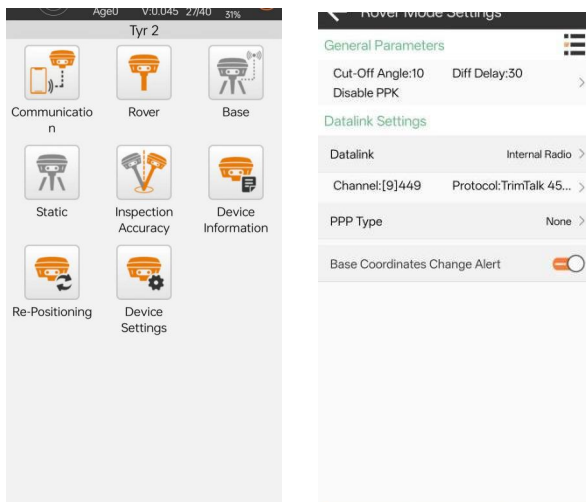
1. Base station - Internal Radio Mode

Go to Base Station Mode, select Internal Radio, and configure the channel frequency and other relevant settings



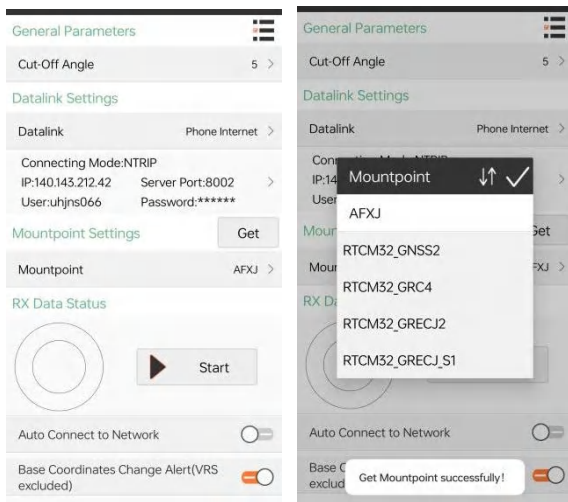
2. Rover - Radio Mode

Go to Rover Mode, select Internal Radio, and configure the channel frequency and other relevant settings



3. Rover - CORS Login

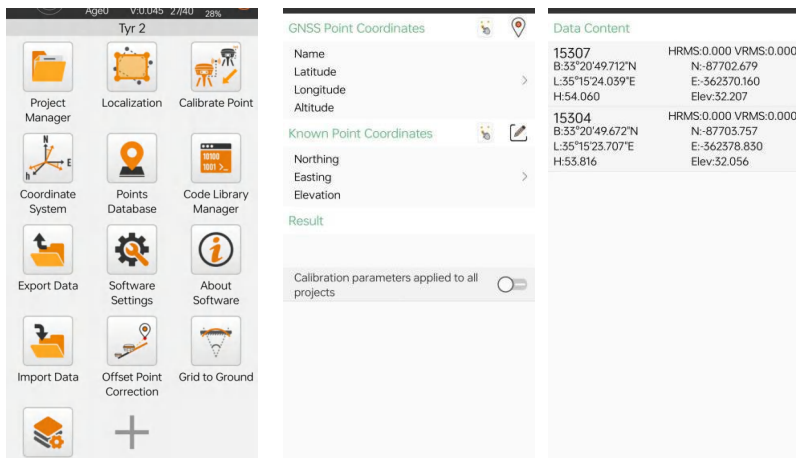
Go to Rover Mode, select Data Recorder Network or Receiver Network, and then access the Datalink Settings, Enter the parameters and select the mountpoint.



2.1.4 Parameter configuration

1. Localization

Go to localization and press Add. Select the control point you entered for the known coordinates and the collected point for GNSS coordinates. Click Calculate to obtain the transformation parameters.



2. Calibrate Point

Perform calibrate point if the base station is moved or powered off and restarted.

Name	Input
Known Point Coordinates	
Northing	
Easting	
Elevation	
GNSS Point Coordinates	
Latitude	
Longitude	
Altitude	
Options	
Use Horizontal Control	☐
Use Vertical Control	☐

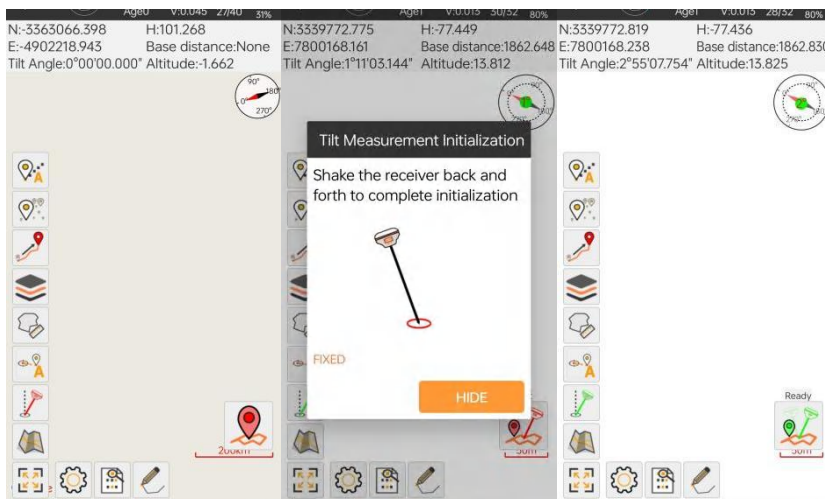
GNSS Point Coordinates	
Name	15307
Base ID	2
Latitude	33°20'49.712"N
Longitude	35°15'24.039"E
Altitude	54.060
Known Point Coordinates	
Name	15305
Northing	-87704.442
Easting	-362377.934
Elevation	32.032
Result	
Adjust Time	2024-05-09 10:39:46
North Offset	-2.046
East Offset	-9.203
Height Offset	-100.095
Calibration parameters applied to all projects ☐	
Recalibrate When Base Position Changes ☐	

2.1.5 Surveying work

1. Tilt survey

In the Point Survey interface, activate Tilt Survey function. Follow the prompts to calibrate and set the antenna height, which can be adjusted at any time.

Begin point survey when “INS Ready” is displayed.



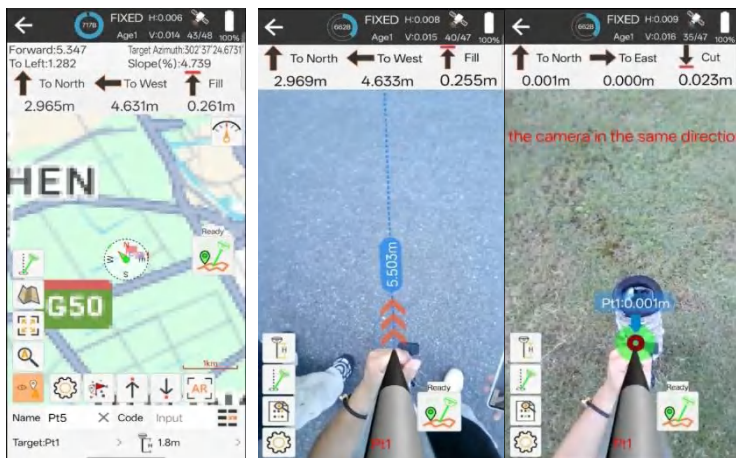
2. Laser point survey

After turning on the laser, it can be used for laser point survey, or by turning on the camera for laser point survey. (Note: To use the camera function, a connection to the receiver's WIFI is required.)



3. AR Stakeout

After selecting a stakeout point and entering the stakeout interface, press the AR button to use AR stakeout.



4. Laser Stakeout

After selecting a stakeout point and entering the stakeout interface, Laser stakeout can also be performed by turning on the laser and camera functions



2.1.6 Export data

Select the desired data formats for export (multiple selections allowed) as shown in the figure, and select the export location and enter the desired file name. Click Export to complete the data export process. If multiple formats are selected, the exported files will be saved in a single folder.

Export Path
ram Storage/AllyNavSurvey/Export

File Name
Project Name
+
Input

Choose Export File Format

Geodetic Coordinates Format(txt)

Point Name, Latitude, Longitude, Altitude, Code

Export Parameters

Distance Unit
Meter

Lat/Lon Format
dd°mm'ss.ssss"

Point Type
☐ Enable

☒ Survey Point
☒ Control Point

☒ Input Point
☒ Cal. Point

Time
☐ Enable

Start Time
2024-05-10 00:00:00

End Time
2024-05-10 23:59:59

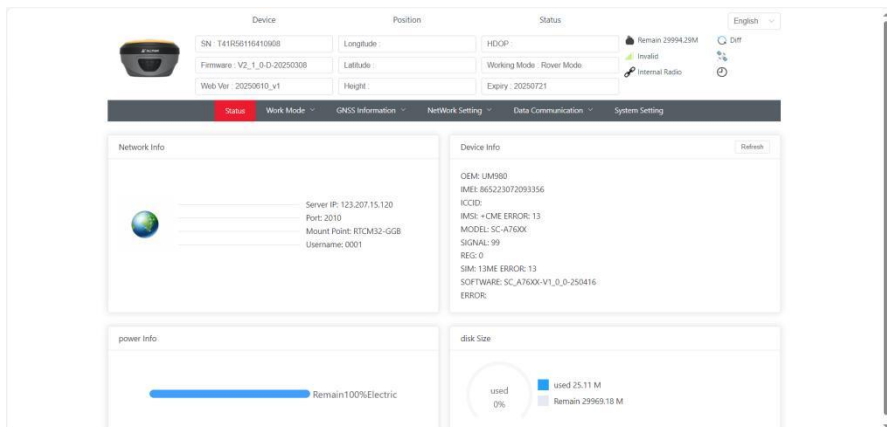
2.2 How to operate WEBUI

2.2.1 Login

Connect your device to the receiver's WiFi. Enter the IP address (192.168.10.1) in a web browser on your device to access the GNSS receiver's web configuration system login page.

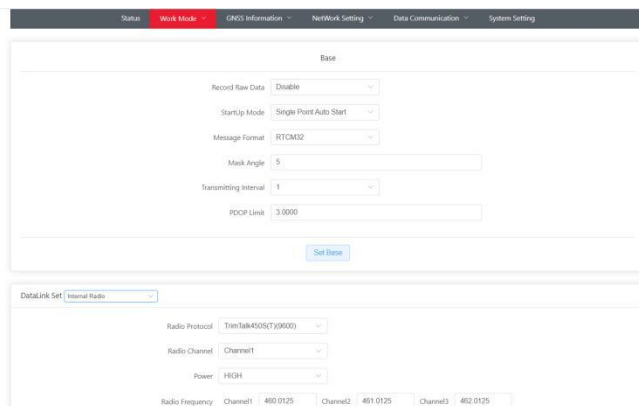
2.2.2 Receiver Status

The home page displays information such as the device, Position, and status. The interface is shown below:



2.2.3 Work Mode

Set the working mode of the receiver. Base station and rover settings are currently supported. Base station: radio mode.



Base

Record Raw Data: Disable

StartUp Mode: Single Port Auto Start

Message Format: RTCM32

Mask Angle: 5

Transmitting Interval: 1

POC Link: 3.0000

Set Base

DataLink Set: Internal Radio

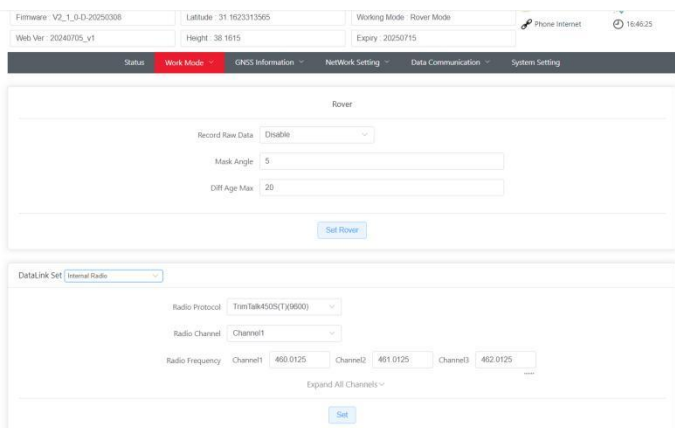
Radio Protocol: TrimTalk450S(TX9600)

Radio Channel: Channel1

Power: HIGH

Radio Frequency: Channel1: 460.0125, Channel2: 461.0125, Channel3: 462.0125

Rover: Radio mode



Firmware: V2_1_0-D-20250308, Latitude: 31.162313565, Working Mode: Rover Mode, Phone Internet, 16:46:25

Web Ver: 20240705_V1, Height: 38.1615, Expiry: 20250715

Rover

Record Raw Data: Disable

Mask Angle: 5

DRT Age Max: 20

Set Rover

DataLink Set: Internal Radio

Radio Protocol: TrimTalk450S(TX9600)

Radio Channel: Channel1

Radio Frequency: Channel1: 460.0125, Channel2: 461.0125, Channel3: 462.0125

Expand All Channels

Set

Rover: Network link mode

Rover

Record Raw Data Disable

Mask Angle 5

Diff Age Max 20

Set Rover

DataLink Set Built in Network

Status Enable

Ntrip Mode Ntrip

IP 115.28.54.212

Port 40599

Username AFXU

Password AFXU

Mount Point AFXU Get

APN Name CMNET

Static:

Device

Position

Status

English

SN: T41RS316208779

Longitude: 121.3070445142

HDOP: 0.7

Remain 29962.80M

Diff

Firmware_V2_1.0-D.20250308

Latitude: 31.1623315957

Working Mode: Rover Mode

Autonomous

28

Web_Ver: 20240705_v1

Height: 38.1417

Expiry: 20250715

Phone Internet

16:47:05

Status

Work Mode

GNSS Information

NetWork Setting

Data Communication

System Setting

Static

Interval 1s

Point Name 1234

Antenna Height 1.967

Measure Method BOTTOM

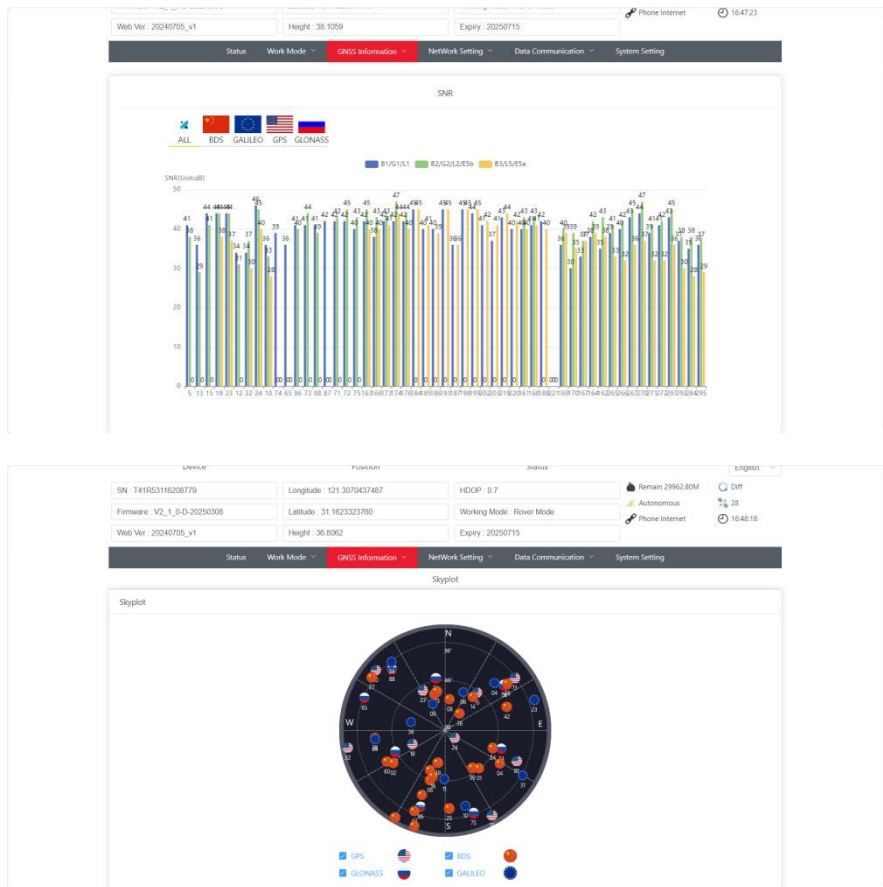
PDOP Limit 3.0000

Mask Angle 5

Set Static

2.2.4 GNSS information

This page displays a list of all satellites being tracked by the receiver, a sky plot of satellite, and signal-to-noise ratios for satellites. The list of satellites is shown below:



2.2.5 NetWork Setting

This page mainly sets the APN parameters

Device

Position

Status

English

SN: T41R53116208779

Longitude: 121.3070425852

HDOP: 0.7

Remain 29962.80M

Diff

Firmware: V2_1_0-D-20250308

Latitude: 31.1623335080

Working Mode: Rover Mode

Autonomous

28

Web Ver: 20240705_v1

Height: 36.1448

Expiry: 20250715

Phone Internet

16:48:12

Status

Work Mode

GNSS Information

NetWork Setting

Data Communication

System Setting

Mobile Config

Parameter Setting

APN Name: CMNET

APN User

APN Password

Set

2.2.6 Data Communication

Download static data from the receiver

Device

Position

Status

English

SN: T41R53116208779

Longitude: 121.3070408467

HDOP: 0.7

Remain 29962.80M

Diff

Firmware: V2_1_0-D-20250308

Latitude: 31.1623338365

Working Mode: Rover Mode

Autonomous

28

Web Ver: 20240705_v1

Height: 36.8554

Expiry: 20250715

Phone Internet

16:49:48

Status

Work Mode

GNSS Information

NetWork Setting

Data Communication

System Setting

File

Current Path: /sdcard/

☐	Name	Size	Time	Operation
☐	19700101	32.00 KB	Jan 1 1980	Delete
☐	log	32.00 KB	Mar 14 16:32	Delete
☐	20250315	32.00 KB	Mar 15 07:53	Delete
☐	20250415	32.00 KB	Apr 15 18:09	Delete
☐	20250416	32.00 KB	Apr 16 02:07	Delete
☐	20250514	32.00 KB	May 14 08:33	Delete
☐	20250519	32.00 KB	May 19 14:56	Delete
☐	syslog	32.00 KB	Jul 1 16:37	Delete

Delete

If other data transmission links are needed, it can be set up in this page

Device		Position		Status		English	
SN : T41RS3116208779	Longitude : 121.3070375823	HDOP : 0.7		Remain 29962.80M		Diff	
Firmware : V2_1.0-D-20250308	Latitude : 31.1623331915	Working Mode : Rover Mode		Autonomous		28	
Web Ver : 20240705_v1	Height : 36.1934	Expiry : 20250715		Phone Internet		16:51:17	

Status	Work Mode	GNSS Information	Network Setting	Data Communication	System Setting
SOCKET					
CH01	Mode : TCP Client	Data : NMEA Data	Server IP : 115.28.106.73	Server Port : 17777	Local Port : Set
CH02	Mode : TCP Client	Data : NMEA Data	Server IP : 115.28.106.73	Server Port : 12222	Local Port : Set
CH03	Mode : Select	Data : Select	Server IP :	Server Port :	Local Port : Set
CH04	Mode : Select	Data : Select	Server IP :	Server Port :	Local Port : Set
CH05	Mode : Select	Data : Bidirectional	Server IP :	Server Port :	Local Port : Set

2.2.7 System setting

System setting and system upgrade can be operated in this page.

Device		Position		Status		English	
SN : T41RS3116208779	Longitude : 121.3070371522	HDOP : 0.7		Remain 29962.80M		Diff	
Firmware : V2_1.0-D-20250308	Latitude : 31.1623330015	Working Mode : Rover Mode		Autonomous		28	
Web Ver : 20240705_v1	Height : 36.0449	Expiry : 20250715		Phone Internet		16:50:56	

Status	Work Mode	GNSS Information	Network Setting	Data Communication	System Setting
SystemSetting					
Shutdown Register FunctionRegister					
Time Zone Voice Broadcast					
SystemUpgrade					
Upgrade Firmware Upgrade IMU Upgrade OEM					
Power					
Auto Boot : Disable					
Set					

III. Firmware Update

If a firmware update is required for the receiver, it can be performed either through the WEBUI or using a data cable.

IV. Advanced Functions

The advanced functions include a base station shift warning. We recommend you become familiar with the basic functions before operating the device, or operate the device under the guidance of a professional.

4.1 Base station shift warning

If the base station is tilted or moved by impact, AllyPad will alert the user that the base station coordinates have changed. The coordinates that are collected after a base station shift will be inaccurate. Power cycle the base station and correct its position before continuing work.

FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note: The Grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

The device has been evaluated to meet general RF exposure requirement.

To maintain compliance with FCC's RF exposure guidelines, the distance must be at least 25 cm between the radiator and your body, and fully supported by the operating and installation configurations of the transmitter and its antenna(s).



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